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[短報]

Notes on High Numbers of Pearls and Blister Pearls from *Perna viridis* and Preliminary Survey of Bivalve-inhabiting Hydroids in the Eastern Coasts of the Gulf of Thailand

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シャム湾東岸のタイ国産ミドリイガイに見られた多数の真珠と殻付真珠の記録およびカイヤドリヒドラのポリプの予備的探索結果

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Abstract On December 23 and 24, 2004, a biological survey of bivalve-inhabiting hydrozoans and pearls was conducted on 398 specimens of five bivalve species (158 specimens of *Perna viridis*, 148 of *Saccostrea forskali*, 81 *Meretrix meretrix*, 39 *M. lyrata* and 72 *Tegillarca granosa*), all obtained in a field and a seafood market in the eastern coasts of the Gulf of Thailand. High number of pearls (31 and 26) embedded in the mantle were detected in two specimens of *Perna viridis*. Furthermore, many blister pearls (attached pearl) were produced on the inner surface of these shells. However, bivalve-inhabiting hydroids were not yet found in the mantle cavity of any bivalve species examined, though other commensal animals such as copepods and turbellarians were found.

Key words bivalve-inhabiting hydroids, blister pearl, Gulf of Thailand, pearl, *Perna viridis*

Introduction

The biological studies on the bivalve-inhabiting hydrozoans have been made around the world in bivalves of various mode of life such as the burrowing type in sandy or muddy beach and the attaching type like mussels and oysters (Kubota, 1983, 1992, 2000, 2003, 2004; Piraino *et al.*, 1994; Migotto *et al.*, 2004; Govindarajan *et al.*, 2005). In Thailand, there were no such basic surveys, and in the checklist of marine bivalves along the Chonburi and Rayong Provinces in the eastern coast of the Gulf of Thailand, Sanpanich (1998) and Yoosuk and Duang-dee (1999) did not mention on this topic. Therefore, we started to carry out the colloborate study on this subject.

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Based mainly on observations made in Japan, Taiwan and India, we expected to find some bivalve-inhabiting hydrozoans along the eastern coasts of the Gulf of Thailand, where a warm current, the North Equatorial Counter Current, influences the hydrobiology of the area together with a good deal of mass aquaculture of a green mussel (*Perna viridis*) and oysters for seafood. Along this area, there are 4 provinces that close up with the shoreline down until Kambodia border. We chose Chonburi Province to carry out the first study since the sea is calm and culture of seashells is prevalent, allowing existence of the bivalve -inhabiting hydrozoans (cf. Kubota, 1983, 1987, 2000). Moreover, we searched to find out high number of pearls in the mantle cavity of the bivalve since such a case was recently detected in South Africa (Kubota and Buecher, 2004). The present reports note the preliminary results of this survey on these two purposes.

Materials and Methods

On December 23 and 24, 2004, a faunistic survey of bivalve-inhabiting hydrozoans was conducted on *Perna viridis* (Linnaeus, 1758), *Saccostrea forskali* (Gmelin, 1791), *Meretrix meretrix* (Linnaeus, 1758), *M. lyrata* (Sowerby, 1851) and *Tegillarca granosa* (Linnaeus, 1758), all are easy to obtain in a field and a seafood market. A total of 158 *P. viridis* were collected from the hanging culture area in the sea in front of the Fisheries Research Station, Sriracha District, while 148 *S. forskali*, 81 *M. meretrix*, 39 *M. lyrata* and 72 *T. granosa* were bought at Angsila market, Muang District, Chonburi Province. The specimens from Angsila were caught by various sources. *S. forskali* was harvested from hanging rope for farming oysters in a sea offshore of Angsila market. *M. meretrix* and *M. lyrata* were collected by local fishermen from sandy beaches along the coast of Chonburi Province. *T. granosa* were harvested from muddy bottom, offshore of Chonburi coasts.

All specimens were examined soon after collection, within 1 day after brought them back to the laboratory, under a stereoscopic microscope. The adductor muscle of each shell was cut with a knife and the surface of all the soft body portions of the mantle cavity was carefully examined in a air-conditioned room (ca 25 ℃). Careful examinations were made to confirm the presence of pearls, blister pearls that attached to the inner surface of bivalve shell, and of bivalve-inhabiting hydroids on soft body portions.

Results and Discussion

(1) Record of a high number of pearls and blister pearls

In the present study, two specimens of *P. viridis* collected from the Fisheries Research Station on December 23, 2004, had a high number of pearls. The shell sizes were 77 and 86 mm, respectively along its anterior-posterior axis. In the smaller shell the number of pearls were 23 on the left valve of the mantle and 3 on the right side, thus 26 pearls in total, while the number of pearls were 27 and 4, respectively in the larger shell (Table 1; Fig. 1). All of the pearls were found on the mantle of the shells. Pearls were small and the shape was oval or irregular.

Judging from the appearance of numerous blister pearl attached to shells (Fig. 2) in addition to the above-mentioned ordinary pearls, as is a similar case

Table 1. Occurrence of many pearls and results of preliminary biological survey on bivalve-inhabiting hydroids in five bivalve species obtained in a sea in front of the Fisheries Research Station, Sriracha District and Angsila market, Muang District, Chonburi Province, Thailand.

表1. タイ国チョンブリ州、スリラチャ区所在の水産研究所の前浜とムアン区アンシラ市場で入手した5種の二枚貝でのカイヤドリヒドラ類のポリプの予備的な生物学的調査結果および多数の真珠形成.

Species	Collected/ Purchased	Substratum of shells atttached	No. of shells examined	Size of shells in mm*, **, ***	Hydroids in the mantle cavity	No. of pearls in left and right valve
Perna viridis	Sriracha Station	Ropes	118	15-100*	absent	0+0
			1	77*	absent	23+3
			1	86*	absent	27+4
P. viridis	Angsila market	Bambooes	38	70-100*	absent	0+0
Saccostrea forskali	Angsila market	Ropes	148	50-60**	absent	0+0
Meretrix lyrata	Angsila market	Sand	39	44-49***	absent	0+0
Meretrix meretrix	Angsila market	Sand	81	24-34***	absent	0+0
Tegillarca granosa	Angsila market	Mud	72	30-43***	absent	0+0

* anterior-posterior axes. ** shell height. *** shell length.

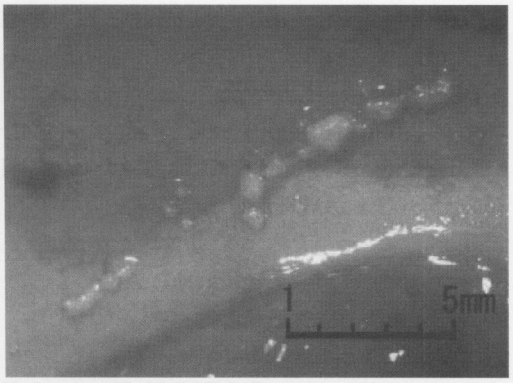

Fig. 1. Pearls embedded in the left mantle of *Perna viridis* collected from a sea in front of the Fisheries Research Station, Sriracha District, Chonburi Province, Thailand (Photographed in the laboratory of Institute of Marine Science, Burapha University soon after opening).

図1. タイ国チョンブリ州スリラチャ区にある水産研究所前浜より採集したミドリイガイの左側の外套膜中に埋もれている真珠（ブラパ大学海洋科学研究所の実験室で解剖直後に撮影).

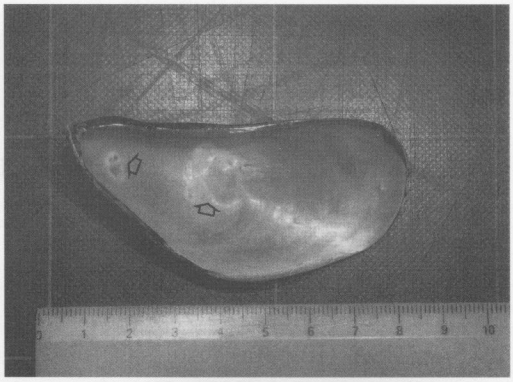

Fig. 2. Blister pearl (→) on inner side of left shell of *Perna viridis* (scale in centimeter), the same specimen as shown in Fig. 1.

図2. ミドリイガイの左側の貝殻内面に形成された殻付真珠（→）（スケールはcm). 図1と同じ標本.

observed in *Mytilus galloprovincialis* from South Africa (Kubota and Buecher, 2004), we think that a physical shock occurred that induced cracking of the inner shell layer, then these shards become the cores of the pearls.

Observations on pearls have been carried out by Kubota over the last 25 years in the world on tens of thousands of bivalves. On the Japanese seacoast, no specimens of *Mytilus* have been seen with a several tens of pearls in their mantle cavity (Kubota, unpubl. data). The same trend was observed recently by Kobayashi (unpubl. data) on tens of thousands of *Mytilus galloprovincialis* on various coasts of Japan, recording less than 10 pearls embedded in a mantle of the shell.

(2) Survey of bivalve-inhabiting hydrozoans

No bivalve-inhabiting hydrozoans were found in the mantle cavity of any individual of bivalves examined (Table 1), while many commensal copepods and turbellarians were found in *Perna viridis*. Kubota and his colloborators have been observed at least tens of thousands of mussels from various countries such as Brazil, Croatia, India, Italy, Japan, Spain, Taiwan, USA (Kubota, 2000; 2004; unpubl. data; Migotto *et al.*, 2004; Kubota *et al.*, 2005) and incidences of complete absence in a tropical to temperate region are uncommon. Much more surveys are needful in the present region since in such a region in the Southeast Asia, two species of bivalve-inhabiting hydrozoans, *Eutima commensalis* Santhakumari, 1970 and *Eugymnanthea japonica* Kubota, 1979 has been reported. *Eutima commensalis* recorded from west and east coasts of India was found within the mantle cavity of both wood-bores and mussel-like bivalves (Santhakumari and Balakrishnan Nair, 1969; Santhakumari, 1970; Ramachandra Raju *et al.*, 1974; Kubota, 2005). *Eugymnanthea japonica* was recorded from Taiwan and wide regions in Japan affected by the warm current Kuroshio, north of Okinawa Island, associating with *Mytilus galloprovincialis* Lamarck, *Perna viridis* (Linnaeus), *Dendrostrea sandvichensis* (Sowerby), *Crassostrea gigas* Thunberg, *C. vitrefacta* (Sowerby), *C.* sp, and *Barbatia virescens* (Reeve) (Kubota, 1987; Kubota *et al.*, 1999; 2003; 2005). Therefore, it is possible that much more basic surveys on the present subject in Thailand give us a new record of some bivalve-inhabiting hydrozoans.

It should be mentioned here that an complete absence was noticed on the west coast of the United States and also on the southwestern part of South Africa, influenced by a cold current where bivalve-inhabiting hydrozoans are difficult to survive since they usually inhabit in tropical and subtropical regions and can not tolerate cold temperature (Kubota, 1998; 2000; Kubota and Buecher, 2004).

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要 約

シャム湾東岸のタイ国チョンブリ地区で採集あるいは購入した現地産5種398個体の二枚貝に、カイヤドリヒドラ類の共生がみられるか、2004年12月末に調査した。158個体のミドリイガイ*Perna viridis*, 148個体のボンベイガキ*Saccostrea forskali*, 81個体のタイワンハマグリ *Meretrix meretrix*, 39個体のミスハマグリ *M. lyrata*および72個体のハイガイ*Tegillarca granosa* の外套腔のいずれにもカイヤドリヒドラ類は発見されなかった。一方、2個体のミドリイガイの外套膜組織内に、それぞれ31個と26個もの多数の小さな真珠が形成され、しかもそれら2個体の貝殻の内面に殻付真珠（付着真珠）が多数形成されていたので、希少例として報告する。

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